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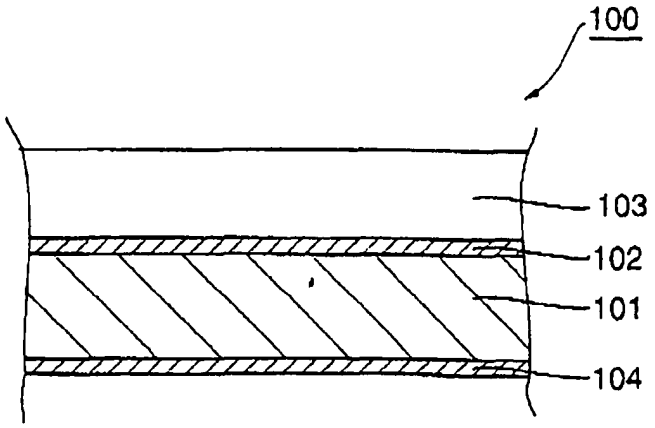
(54) Composite recording medium and manufacturing method therefor, recording medium set, dot recording apparatus and dot recording method

(57) An object of the present invention is to provide a recording medium having functions for trial printing. To realize that object, the composite recording medium of the present invention has two or mere types of parts exhibiting different surface properties integrated in one sheet of recording paper.

FIG.1



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Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to a composite recording medium wherein two or more types of parts having different surface properties are integrated, a manufacturing method therefor, and a set of two or more types of recording mediums having different surface properties.

[0002] More particularly, the present invention relates to a composite recording medium wherein two or more parts having different surface properties are integrated, capable of most effectively obtaining ink images having desired image quality, and exhibiting outstanding productivity in terms of obtaining images with a plurality of image qualities at one time, a manufacturing method and recording method therefor, recordings wherein ink images are recorded using the same, a recording medium set containing the same, and a recording medium set comprising two or more types of recording mediums having different surface properties.

[0003] The present invention also relates to a dot recording apparatus suitable for those composite recording mediums.

2. Description of the Related Art

[0004] Demand has arisen in recent years for recording mediums for forming and recording images (including text characters) wherewith vivid color images can be obtained which exhibit higher resolution as in photographs. There is also a demand for the ability to obtain images of image quality that matches personal preference. This has led to the development of recording mediums that satisfy the demands noted above by suitably adjusting the surface properties (surface quality or surface type) of the recording medium, making it possible to obtain vivid color images at high resolution by providing a glossy layer on the surface of the recording medium, or facilitating ease of viewing by holding down the light reflectance at the surface to a low level, etc.

[0005] Ordinarily, however, in a recording medium, the surface for forming images is of even quality, and it is necessary to do re-recording in cases where the image quality of the recorded image obtained does not match the preference of the image producer, or in cases where it is desired to use another recording medium and compare the quality of the recorded images. There has been a problem, however, in that the use of such recording mediums has proven ineffective in obtaining recorded images exhibiting the desired image quality, it being necessary, for example, to make repeated trial printings until the quality of the recorded image obtained corresponds to personal preference.

[0006] Accordingly, an object of the present invention is to provide a recording medium wherewith the problems noted above can be resolved and recorded images having the desired image quality can be obtained most effectively. Another object of the present invention is to provide a recording medium exhibiting outstanding productivity in that an image having a plurality of image qualities can be obtained in one operation. Yet another object of the present invention is to provide a recording medium for use in making trial printings. Yet another object of the present invention is to provide a set of recording mediums wherewith trial printings can be made. Yet another object of the present invention is to provide a recording medium wherewith it is possible to make trial printings with one sheet of recording paper. Yet another object of the present invention is to provide a dot recording apparatus and dot recording method suitable for the print processing of these recording mediums, and a computer readable recording medium whereon is recorded a program for executing that dot recording method in a print processing apparatus.

SUMMARY OF THE INVENTION

[0007] As a result of assiduous research, the inventors found that the objects noted above can be achieved with a recording medium wherein a plurality of parts having different properties are integrated.

[0008] The present invention, which is based on those research findings, provides a composite recording medium that is characterized by having two or more types of parts exhibiting different surface properties integrated therein.

[0009] In this specification, by "different surface properties" is meant that the surface properties differ in outward appearance. Even if the surface (uppermost face) is uniformly smooth, the surface properties are considered to be different if there is the appearance of difference due to the effects of an internal layer therein. More specifically, in the case of a recording medium wherein a resin coating layer is formed having two or more types of face properties on a substrate, and an ink accepting layer is formed as a surface layer (uppermost layer) on that resin coating layer, the surface properties are considered to differ if the parts noted appear to differ, in terms of external appearance, due to the face properties of that resin coating layer, even though the surface be uniformly smooth.

[0010] With the dot recording method of the present invention, dot recording is performed on a composite recording medium by pre-recording, for each of two or more types of parts configuring the composite recording medium wherein two or more types of parts having different surface properties are integrated, a color compensation table for converting prescribed image data to image data suitable for dot recording processing wherein color separation is performed for each element color, parameters for defining the operation of head drive means for performing drive control for a dot recording

head provided with dot recording element for recording dots on the composite recording medium, parameters for defining the operation of primary scanning drive means for performing primary scanning, relatively driving the dot recording head and the composite recording medium, and parameters for defining the operation of secondary scanning drive means for performing secondary scanning, relatively driving the dot recording head and the composite recording medium each time the primary scanning ends; converting, for each of the two or more types of parts, the image data, referencing the corresponding color compensation table; and controlling the operation of the primary scanning drive means, the head drive means, and the secondary scanning drive means, referencing the parameters.

[0011] Using this method, suitable color compensation processing and dot recording processing can be effected for each of the two or more kinds of parts configuring the composite recording medium. Therefore, dot recording processing of high image quality can be realized without a dramatic decline in the overall composite recording medium dot recording processing speed.

[0012] In this specification, by "dot recording element" is meant a component for recording dots, such as an ink nozzle in an ink jet printer. Accordingly, besides the piezo jet scheme wherein the capacity of a pressurized chamber is changed by the volumetric change in a piezoelectric element and ink droplets are blown out, this may also be a bubble jet scheme wherein droplets of ink loaded inside a pressurized chamber are blown out when vapor is suddenly generated by the application of heat.

[0013] The present invention further provides a computer readable recording medium on which procedures for effecting the dot recording method noted above are written by a program. By such a computer readable recording medium is meant something whereon a program or the like is recorded by some physical means or other, capable of implementing the desired functions in a print processing apparatus. Accordingly, it may be anything that downloads to the print processing apparatus by some means or other and effects the desired functions.

[0014] Examples include not only transportable recording media such as an optical disk (CD-ROM, DVD-ROM, DVD-RAM, DVD-R, PD disk, MD disk, and MO disk, etc.), but also flexible disks (FD) or internal memory devices such as a RAM or ROM inside a computer, or an external memory device such as a hard disk. Also included are paper whereon bar code is recorded, and cards in which holes are punched according to a code system.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015]

Fig. 1 is a section of a first embodiment aspect of the composite recording medium of the present invention;

Fig. 2 is a section of a second embodiment aspect of the composite recording medium of the present invention;

Fig. 3 is a plan of a third embodiment aspect of the composite recording medium of the present invention;

Fig. 4 is a section at the A-A line in the composite recording medium diagrammed in Fig. 3;

Fig. 5 is a bottom view of the composite recording medium diagrammed in Fig. 3;

Fig. 6 is a plan of a fourth embodiment aspect of the composite recording medium of the present invention;

Fig. 7 is a section at the B-B line in the composite recording medium diagrammed in Fig. 6;

Fig. 8 is an oblique view of a plurality of rollers used in one embodiment aspect of the composite recording medium manufacturing method of the present invention;

Fig. 9 is a simplified diagram representing a condition wherein a plurality of recording medium parts have been formed, using the rollers diagrammed in Fig. 8, on raw material used in manufacturing;

Fig. 10 is a plan of a recording wherein a plurality of the same image has been recorded on the composite recording medium diagrammed in Fig. 6;

Fig. 11 is a simplified diagram of one embodiment aspect of the recording medium set of the present invention;

Fig. 12 is a section of a fifth embodiment aspect of the composite recording medium of the present invention;

Fig. 13 is a plan of the composite recording medium diagrammed in Fig. 12 as seen from the side of the peel-away base material;

Fig. 14 is a plan of a photographic seal form of composite recording medium (part of which is peeled away) wherein the fifth embodiment aspect in the present invention has been applied;

Fig. 15 is a plan of a composite recording medium that comprises image printing area and text printing area;

Fig. 16 is a functional block diagram of a print processing apparatus of the present invention;

Fig. 17 is a simplified configuration diagram of a printer engine unit in a color printer;

Fig. 18 is an explanatory diagram representing the structure of a print head;

Fig. 19 is an explanatory diagram representing the structure of a print head;

Fig. 20 is a section of an ink ejecting head;

Fig. 21 is a section of an ink ejecting head;

Fig. 22 is an explanatory diagram representing a nozzle array in an ink ejecting head;

Fig. 23 is an explanatory diagram of a dot formation pattern formed by one nozzle array;

Fig. 24 is a functional block diagram relating to drive control responsive to the recording mode;

Fig. 25 is an explanatory diagram of a recording mode table;

Fig. 26 is an explanatory diagram for recording mode parameters; and

Fig. 27 is an explanatory diagram for recording mode parameters.

DESCRIPTION OF THE PREFERRED EMBODIMENT

[0016] The composite recording medium of the present invention is described below in detail, based on preferred embodiment aspects thereof, while making reference to the drawings.

[0017] First, a detailed description is given of a first embodiment aspect of the composite recording medium of the present invention. Fig. 1 is a section of the first embodiment aspect of the composite recording medium of the present invention.

[0018] The composite recording medium 100 in the first embodiment aspect is configured of a substrate 101, a transparent ink accepting layer 103 deployed on the substrate 101 over an intervening resin coating layer 102, and a resin coating layer 104 deployed on the back surface (the face on the opposite side from the ink accepting layer 103) of the substrate 101.

[0019] In the composite recording medium 100 in this embodiment aspect, the resin coating layer 102 on the substrate 101 comprises two or more types of parts having differing face properties. By such a configuration as this, the composite recording medium 100 of this embodiment aspect has two or more parts having different surface properties integrated therein. Moreover, the face properties of the resin coating layer 102 do not appear in Fig. 1, but when represented by a plan (i.e. the plan of the composite recording medium 100 from which the ink accepting layer 103 has been omitted), those face properties do appear.

[0020] For the two or more parts having the different surface properties, use may be made of two or more parts having different glossiness, or two or more parts having different smoothness, or two or more parts differing in both glossiness and smoothness. More specifically, the two or more types of parts may be two or more types of parts selected from a group made up of glossy tone parts, semi-glossy tone parts, matte tone parts, and silk-weave tone parts. Among these parts, moreover, one or more can have a plurality of recording areas divided according to the strength or weakness of the light reflectance thereof.

[0021] For the substrate 101 used in this embodiment aspect, there is no particular limitation, and commonly used paper can be employed, but it is preferable that this be smooth, high-density stencil paper such as is used as the substrate (supporting body) for photographs.

[0022] For the material forming the resin coating layers 102 and 104 used in this embodiment aspect, polyolefin resins used for thermally melting extrusion coatings are preferable, with polyethylene resins being particularly preferable.

[0023] It is also possible to use a sheet for the substrate 101 wherein the resin coating layers 102 and 104 have been provided beforehand on both sides respectively. For this sheet, for example, the resin coating paper, etc., described in Japanese Patent Application Laid-Open No. H11-188966/1999, can be used. In this embodiment aspect, the method for forming the resin coating layers 102 and 104 on both sides of the substrate 101 may be, besides the thermally melting extrusion coating method alluded to above, a method whereby a latex capable of forming a film is coated. It is possible, for example, to coat the substrate 101 with a latex having a low minimum film-forming temperature (MFT) and then heating to a temperature that is equal to or higher than that minimum film-forming temperature (cf. Japanese Patent Application Laid-Open No. H11-188966/1999).

[0024] The ink accepting layer 103 used in this embodiment aspect is a layer for reproducing color images and photographic images and the like at high quality. Any of the materials known in the prior art can be used as the material for forming this ink accepting layer 103. More specifically, it is preferable that the ink accepting layer contain an ink absorbing pigment, an ink fixing agent, and a binder, but also containing, as necessary, various types of additives such as dye fixing agents (water resistance enhancing agents), fluorescent brightening agents, surfactants, antifoaming agents, pH adjusting agents, anti-molding agents, UV absorbers, and anti-oxidants.

[0025] The ink accepting layer 103 is formed by dissolving or dispersing the binder noted above in a suitable solvent, adding thereto the ink fixing agent, adding the various additives noted above as necessary, then coating the resulting coating liquid onto the resin coating layer 102 by a known coating method such as roller coating, spray coating, rod bar coating, or air knife coating, and causing that to dry.

[0026] The composite recording medium 100 in the first embodiment aspect can be fabricated, for example, by forming the resin coating layers 102 and 104 on the substrate 101 and on the back side thereof, then imparting two or more types of face properties to the resin coating layer 102 by rolling, next forming the ink accepting layer 103 on the resin coating layer 102 after the face properties have been imparted thereto, and thus imparting two or more types of surface properties.

[0027] The roller used here may be a rotogravure roller, for example, which can be used to emboss the resin coating layer 102 and thereby to impart two or more types of face properties thereto.

[0028] Next, a second embodiment aspect of the composite recording medium of the present invention is described in detail. Fig. 2 is a section of the second em-

bodiment aspect of the composite recording medium of the present invention.

[0029] The composite recording medium 200 in the second embodiment aspect is configured from a substrate 201, an ink accepting layer 202 deployed on that substrate 201, and a glossy layer 203 deployed on that ink accepting layer 202.

[0030] In the composite recording medium 200 in this embodiment aspect, the glossy layer 203 comprises two or more types of parts having differing surface properties. By such a configuration as this, the composite recording medium 200 in this embodiment aspect has two or more parts exhibiting different surface properties integrated therein.

[0031] In the second embodiment aspect, the form of the two or more parts having differing surface properties is the same as in the first embodiment aspect described earlier.

[0032] It is preferable that the glossy layer 203 used in this embodiment aspect be configured from a white pigment and a binder. This white pigment may be, for example, an inorganic pigment such as light calcium carbonate, heavy calcium carbonate, magnesium carbonate, kaolin, talc, calcium sulfate, barium sulfate, titanium dioxide, zinc oxide, zinc sulfide, zinc carbonate, satin white, aluminum silicate, diatomaceous earth, calcium silicate, magnesium silicate, synthetic amorphous silica, colloidal silica, alumina, colloidal alumina, false boehmite, aluminum hydroxide, lithopone, zeolite, hydrated halloysite, and magnesium hydroxide, or an organic pigment such as a styrene plastic pigment, acrylic styrene pigment, polyethylene, micro-capsule, ureic resin, or melamine resin. Of these, synthetic amorphous silica and the like are to be preferred.

[0033] The binder may be, for example, an oxidized starch, etherized starch, phosphate esterized starch or other starch derivative, carboxymethyl cellulose, hydroxyethyl cellulose, or other cellulose derivative, casein, gelatin, soy protein, polyvinyl alcohol, or derivative thereof, polyvinyl alcohol or silanol denatured product, carboxylated product, cationated product, or other of various derivatives thereof, polyvinyl pyrrolidone, anhydrous maleic acid resin, styrene butadiene copolymer, methyl methacrylate butadiene copolymer, or other conjugated diene copolymer latex, polymer or copolymer of acrylic acid ester and methacrylic acid ester or other acrylic polymer latex, ethylene vinyl acetate copolymer or other vinyl polymer latex, or functional group denatured polymer latex resulting from treating these various kinds of polymers with a monomer containing a carboxy group or other functional group, melamine resin, ureic resin, or other thermally hardening synthetic resin or other aqueous adhesive, polymethyl methacrylate or other acrylic acid ester, methacrylic acid ester polymer or copolymer resin, polyurethane resin, unsaturated polyester resin, vinyl chloride-vinyl acetate copolymer, polyvinyl butylate, alkyd resin, or other synthetic resin type adhesive, or the like.

[0034] The glossy layer 203 noted earlier can also contain various additives for the purpose of improving the properties of the composite recording medium 300. Specific preferred examples of such additives include anti-oxidants, UV absorbents, fluorescent brightening agents, water resistance enhancing agents, anti-fading agents, and anti-static agents, etc.

[0035] The glossy layer 203 can be formed by coating a coating liquid prepared by dissolving or dispersing the components forming that glossy layer 203 in water or a suitable solvent onto the ink accepting layer 3 using any of various types of apparatuses including, for example, a blade coater, roll coater, bar coater, rod blade coater, curtain coater, short dwell coater, or size press, etc. Further, in order to enhance smoothness, calender processing may be performed using a machine calender, TG calender, super calender, or soft calender, etc.

[0036] The coating weight of the coating liquid noted above should here be 5 to 40 g/m^2, and preferably 10 to 30 g/m^2.

[0037] The glossy layer 203 is not particularly limited in terms of its glossiness or thickness, etc., so long as the two or more types of parts having different surface properties are integrated therein.

[0038] Stencil paper is used for the substrate 201 used in this embodiment aspect. It is to be preferred that this stencil paper be made from a pulp raw material consisting mainly of natural cellulose fiber, for example. The pulp raw material may be NBKP, LBKP, NBSP, LBSP, GP, TMP, or old paper or the like. It is possible to use mixtures of these materials mixed in proportions suitable for multiple purposes.

[0039] The thickness of the substrate 201 may be suitably determined, but should in general be 50 to 500 μm and preferably 100 to 300 μm or so.

[0040] The composition of the ink accepting layer 202 used in this embodiment aspect is the same as the composition of the ink accepting layer 103 used in the first embodiment aspect.

[0041] The composite recording medium 200 of the second embodiment aspect can be fabricated, for example, by forming the ink accepting layer on the substrate, then forming the glossy layer on that ink accepting layer, and next imparting two or more types of surface properties to the glossy layer using a film.

[0042] The film used here may be a polyethylene terephthalate (PET) film or the like, for example. On this film is provided a transfer form for the desired surface quality (surface property) to be imparted to the glossy layer 203. By using that to emboss the glossy layer 203, two or more types of surface properties can be imparted. When doing this, the film provided with the transfer form is superimposed on the glossy layer 203, embosses it, and is then peeled away from that glossy layer 203.

[0043] Next, a detailed description is given of a third embodiment aspect of the composite recording medium of the present invention. Fig. 3 is a plan of the third embodiment aspect of the composite recording medium of

the present invention. Fig. 4 is a section at the A-A line in Fig. 3.

[0044] The composite recording medium 300 in this embodiment aspect is configured with recording medium pieces (hereinafter called simply medium pieces) having a glossy tone part 310, semi-glossy tone part 311, matte tone part 312, and silk-weave tone part 313 respectively integrated on the surface thereof. Those medium pieces, as diagrammed in Fig. 4, are respectively configured of a substrate 301, an ink accepting layer 302 deployed on that substrate 301, and a glossy layer 303 deployed on that ink accepting layer 301.

[0045] The substrate 301, ink accepting layer 302, and glossy layer 303 used in the composite recording medium 300 of this embodiment aspect are the same, respectively, as those used in the second embodiment aspect.

[0046] The composite recording medium 300 in the third embodiment aspect can be fabricated as follows, for example. That is, stencil paper made using pulp raw material is used for the substrate 301. On the surface of this substrate 301, a coating liquid prepared by dissolving or dispersing the components forming the ink accepting layer 301 in water or a suitable solvent is coated on by a coating method and dried to form the ink accepting layer 301. Next, on the surface of that ink accepting layer 302, a coating liquid prepared by dissolving or dispersing the components forming the glossy layer 303 in water or a suitable solvent is coated, dried, and subjected to a calender treatment as necessary, to provide the glossy layer 303 and obtain recording medium pieces. Four of these recording medium pieces are prepared, whereupon, by embossing using the roller used in the first embodiment aspect described earlier or a film, different surface properties are imparted thereto, respectively, and the four recording medium pieces having differing surface properties are formed. After that, as diagrammed in Fig. 5, the back faces (faces on the opposite side from the ink accepting layer 302) of the respective medium pieces are integrated using tape 320 that is cellophane tape or the like.

[0047] Next, a fourth embodiment aspect of the composite recording medium of the present invention is described in detail. Fig. 6 is a plan of the fourth embodiment aspect of the composite recording medium of the present invention. Fig. 7 is a section at the B-B line in Fig. 6.

[0048] The composite recording medium 400 of this embodiment aspect is configured, as diagrammed in Fig. 7, of a supporting body 1, an adhesive layer 5 deployed on that supporting body 1, and four recording medium pieces (hereinafter called merely medium pieces) having different surface properties deployed on that adhesive layer 5. The medium pieces are each configured of a base material 2, a porous ink accepting layer 3 for absorbing and fixing the ink, deployed on that base material 2, and a glossy layer 4 deployed on that ink accepting layer 3.

[0049] The composite recording medium 400 of this embodiment aspect, moreover, as diagrammed in Fig. 6, has a glossy tone part 41 and a silk-weave tone part 42 integrated and deployed on the surface thereof. These two parts 41 and 42 are parts that express the surface properties of the glossy layer 4 of each medium piece.

[0050] The glossy tone part 41 is made by, for the glossy layer 4, forming a smooth surface layer having the property of strong light reflectance, while the silk-weave tone part 42 is made by, for the glossy layer 4, imparting silkiness to the smooth surface layer that made the glossy tone part 41, and thereby forming a layer having the property of low light reflectance.

[0051] In the composite recording medium 400 in this embodiment aspect, the glossy tone part 41, further, due to the light reflectance strength or weakness (the level of glossiness of the 60-degree mirror surface defined by JIS 28741, for example), is divided into a recording area 41a and a recording area 41b. The silk-weave tone part 42 is further divided into a recording area 42a and a recording area 42b by the light reflectance strength or weakness.

[0052] A description is given first here for the medium piece A having the recording area 41a. However, because the medium pieces have the same configuration except in that the surface properties of the glossy layer thereof differ, the description now given appropriately applies to the medium pieces B, C, and D having the other recording areas 41b, 42a, and 42b, except for the points of difference.

[0053] For the glossy layer 4, base material 2, and ink accepting layer 3 used in the medium piece A having the recording area 41a, the glossy layer 203, base material, and ink accepting layer used in the second embodiment aspect described earlier are respectively employed in this embodiment aspect.

[0054] The medium piece A having the recording area 41a is fabricated as follows, for example. That is, stencil paper made using pulp raw material is used for the base material 2. On the surface of this base material 2 is coated a coating liquid prepared by dissolving or dispersing the components forming that ink accepting layer 3 in water or a suitable solvent, using a coating method, and drying that to deploy the ink accepting layer 3. Next, on the surface of that ink accepting layer 3, a coating liquid prepared by dissolving or dispersing the components forming that glossy layer 4 in water or a suitable solvent is coated on, dried, and subjected to a calender treatment, as necessary, to provide the glossy layer 4. Thus the medium piece A having the recording area 41a is fabricated.

[0055] In the medium piece B having the recording area 41b, the light reflectance of the glossy layer 4 is different than in the medium piece A having the recording area 41a. Here, the light reflectance of the glossy layer 4 in this medium piece B may be higher or lower than that of the glossy layer 4 in the medium piece A, just so

long as the light reflectance is different.

[0056] The glossy layer 4 of the medium piece B is formed by selecting, from among the components listed for forming the glossy layer 4 of the medium piece A, components that differ from the components forming the glossy layer 4 of that medium piece A.

[0057] The medium piece C having the recording area 42a, meanwhile, is a piece wherein the glossy layer 4 thereof has a silk-weave tone pattern. This medium piece C is formed by imparting an irregular silk-weave pattern to the smooth glossy layer 4 having glossiness, fabricated in the same way as the medium piece A having the recording area 41a, using a roller, for example, wherein irregularities have been provided, while applying pressure.

[0058] The medium piece D having the recording area 42b is a piece wherein the glossy layer 4 thereof has a silk-weave tone pattern that differs from that of the glossy layer 4 of the medium piece C. This medium piece D is formed by imparting an irregular silk-weave pattern to the smooth glossy layer 4 having glossiness, fabricated in the same way as the medium piece A having the recording area 41a, using a roller, for example, wherein irregularities have been provided, while applying pressure. At this time, the formation of the silk-weave shape by the irregular roller is performed by altering the size of the lattice pattern on the irregular roller, making the pressure applied to the medium piece by the irregular roller stronger or weaker than when fabricating the medium piece C described earlier. The silk-weave pattern obtained is not particularly limited so long as it differs (in terms of the surface properties being different) from the silk-weave pattern exhibited by the glossy layer 4 of the medium piece C.

[0059] The composite recording medium 400 in this embodiment aspect can be fabricated by applying prefabricated medium pieces, respectively, at prescribed positions on the supporting body 1 using an adhesive. When that is done, the medium pieces and the supporting body 1 are securely bonded, the medium pieces are securely bonded to each other, and the thickness of the composite recording medium 400 obtained appears to be uniform.

[0060] For the supporting body 1 used in the composite recording medium 400 in this embodiment aspect, photographic print paper or a base material having a resin coating layer such as is used in the first embodiment aspect described earlier or the like may be used, and there is no particular limitation on the material used for that supporting body 1 so long as it does not interfere with the recording of images.

[0061] The thickness of the supporting body 1 is determined appropriately within such range as will not impair the effectiveness of the present invention. Concerning the adhesive used in applying the medium pieces on the supporting body 1, there is no particular limitation, and anything used for sticking pieces of paper to each other can be used.

[0062] The adhesive noted above, after the supporting body 1 and the base material 2 side of the mediums noted above are laminated together, is dried to form the adhesive layer 5. The quantity of this adhesive used is just enough so that the supporting body 1 and the mediums will adhere and not peel away.

[0063] The composite recording mediums of the present ' invention are used in the following way, for example. That is, when the composite recording medium 400 of the fourth embodiment aspect is used, as diagrammed in Fig. 10, by recording the same image (a star shape is used as an example in Fig. 10) a plural number of times, a recording wherein the same image is recorded a plurality of times is obtained. After that, the surface property is selected wherein is formed an ink image having the desired surface property, from that recording, and the ink image is recorded on a recording medium the entire surface of which has the same surface property as that selected surface property. In this manner, images having the desired image quality and recordings containing those images can be obtained most effectively. Needless to say, furthermore, the images obtained here are vivid, high-resolution images.

[0064] Next, a detailed description of a fifth embodiment aspect of the composite recording medium of the present invention is given. Fig. 12 is a section representing the fifth embodiment aspect of the composite recording medium of the present invention. Fig. 13 is a plan as viewed from the peel-away base material side of the composite recording medium diagrammed in Fig. 12.

[0065] The composite recording medium 600 in this embodiment aspect is a pressure sensitive adhesive seal for ink jet recording configured of a print base material 601 whereon is formed an ink accepting layer, a pressure sensitive adhesive layer 602, and a peel-away base material 603, wherein two or more types of parts having differing surface properties are integrated. In this embodiment aspect, the two or more types of parts having differing surface properties appear on the surface of the ink accepting layer in the print base material 601. The morphology thereof is not particularly limited. Such as are seen in the embodiment aspects described earlier can be employed as appropriate.

[0066] In using the composite recording medium 600 in this embodiment aspect, text or images are formed by printing on the surface of the print base material with an ink jet printing apparatus (printer), the peel-away paper is then peeled away, and the adhesive surface is applied to the item on which the application is to be made. When used as a label or seal, moreover, a print base material half cut line 604 is made beforehand in a prescribed shape on the print base material 601, and this portion is peeled away from the peel-away paper for use. The print base material half cut line 604 is such that a cut is made only in the pressure sensitive adhesive layer 602 and print base material 601 of the pressure sensitive adhesive paper, and the peel-away paper 603 is not cut. With this method, only the shape of the label

or seal is peeled away and used.

[0067] The composite recording medium 600 (pressure sensitive adhesive seals) of this embodiment aspect can be easily and accurately applied at prescribed positions, without wrinkles developing, by preferably being used in small seal applications such as home video tape seals, business card size seals, CD-R seals, postcard size seals, and sets of multiple seals measuring 1 to 2 cm × 1 to 2 cm.

[0068] In the composite recording medium of the fifth embodiment aspect, furthermore, for the reasons given below, it is preferable that the print base material 601 have easy removal means (half cut line 605 having a thickness less than that of the peel-away base material, or non-continuous half cut lines 605, for example) for multiple seals, and that the configuration be made such that the easy removal means are formed at positions corresponding to the outer peripheral vicinity of those seals (cf. Japanese Patent Application Laid-Open No. H11-7246/1999). That is, by effecting such a configuration, it becomes possible to easily and accurately apply the seals at prescribed positions, without wrinkles developing, (1) in cases where seals of the same size as government-printed postcards are to be accurately affixed to government-printed postcards, (2) in cases where comparatively large pressure sensitive adhesive seals are used, as large as or larger than postcards, and the application position is not prescribed, (3) in cases where the thickness of the seal (print base material) is on the thin side, and (4) in cases affected by static electricity or where the material is a thin plastic sheet.

[0069] In the composite recording medium in this fifth embodiment aspect, for the print base material 601 whereon the ink accepting layer 602 is formed, there is no particular limitation, and the various print base materials used in the embodiment aspects described earlier can be used, for example. For the pressure sensitive adhesive layer 603 and the peel-away base material 604, also, that which is used in ordinary adhesive seals can be used without any particular limitation applying. If an image is formed on such a composite recording medium 600 as in this fifth embodiment aspect, it can be used as a photographic seal wherein the same image having multiple types of surface properties is formed. It is possible, for example, to use this as a seal whereon is formed an image like a photograph such as that diagrammed in Fig. 13.

[0070] Thus the composite recording mediums of the present invention are preferably used as trial recording mediums for recording ink images of desired image quality. Also, by providing a recording medium set containing pluralities of the composite recording mediums of the present invention and recording mediums wherein the overall surface exhibits a surface property that is the same as one surface property of the plurality of surface properties exhibited by that composite recording medium, respectively, so that those recording mediums contain all of the types of that plurality of surface properties, ink images having desired image quality can be obtained most effectively and enhanced utility is also realized.

[0071] The composite recording mediums of the present invention are preferably used as mediums for ink jet recording. The composite recording mediums of the present invention, in addition, can be used as mediums for bubble jet recording, mediums for recording by a writing instrument such as a pen, and as mediums for recording by various other types of printing schemes that use liquid ink. Moreover, the composite recording mediums of the present invention can be used as recording mediums whereon toner is heated and fixed in an electronic photographic recording scheme such as is used in a copier or printer, or as recording mediums used for labels provided with an adhesive layer.

[0072] In the foregoing, the composite recording mediums of the present invention have been described in terms of preferred embodiment aspects thereof, but the present invention is not limited to or by those embodiment aspects, and suitable modifications of the present invention can be implemented within the range of the gist of the present invention.

[0073] Specifically, in the first embodiment aspect, in place of the ink accepting layer 103, it is possible to use a layer provided with a gap containing organic particles to which are bonded an organic cationic polymer (cf. Japanese Patent Application Laid-Open No. H11-58942/1999), or a layer obtained by using inorganic particles, a water soluble resin, and a prescribed crosslinking agent, crosslinking that water soluble resin while a constant drying rate is indicated, and effecting hardening (cf. Japanese Patent Application Laid-Open No. H11-115308/1999), etc. It is also possible to change to a layer for accepting ink described in Japanese Patent Application Laid-Open Nos. H10-81064/1998, No. H10-119423/1998, H10-119424/1998, H10-175365/1998, H10-193776/1998, H10-203006/1998, H10-217601/1998, H11-20300/1999, H11-20306/1999, Japanese Patent Application Laid-Open No. H7-276789/1995, or Japanese Patent Application Laid-Open No. H8-174992/1997, etc.

[0074] Or, in the second embodiment aspect, instead of imparting surface properties using a film, surface properties can be imparted using a roller. There are methods, for example, wherewith surface properties are imparted by passing the recording medium between a metal roller and a nip roller.

[0075] In the second embodiment aspect, moreover, the recording medium may have no glossy layer deployed, so that the ink accepting layer is the outermost layer, in which case the ink accepting layer, instead of the glossy layer, will become the layer having two or more kinds of parts exhibiting different surface properties.

[0076] Also, in the composite recording medium of the fourth embodiment aspect, the recording area having the glossy tone part and the silk-weave tone part, re-

spectively, can be made one division only, or three or more divisions, or, alternatively, the number of recording areas in both parts can be made different and not only the same.

[0077] Furthermore, as to examples of the silk-weave tone patterns, instead of a lattice-form irregular silk-weave pattern like that diagrammed in Fig. 6, a flat-weave irregular silk-weave pattern or circular irregular silk-weave pattern can be used.

[0078] In the third and fourth embodiment aspects, moreover, composite recording mediums are indicated wherein four parts having different surface properties are integrated, but the number of these parts is not limited, and that number may be two or three, or five or more. Nor is there any particular limitation on the position or size of the parts.

[0079] In other respects, so long as two or more types of parts having different surface properties are integrated, the configuration otherwise can be modified as appropriate. Also, in terms of another method of manufacturing the composite recording medium of the present invention, the composite recording medium can be fabricated by simultaneously using multiple rollers to impart two or more types of surface properties to manufacturing raw material of large width, and then cutting out each recording medium separately. For the multiple rollers, three connected rollers can be used, for example, as diagrammed in Fig. 8. In Fig. 9 is diagrammed a condition wherein the three rollers diagrammed in Fig. 8 have been used simultaneously to impart two or more types of surface properties, respectively, to the manufacturing raw material.

[0080] The recording medium set of the present invention comprises two or more types of recording medium having differing surface properties. The recording medium set of the present invention may be especially suitably used as a trial recording medium set. A preferred embodiment aspect of the recording medium set 500 of the present invention, as diagrammed in Fig. 11, is a set of a plural number of recording mediums 501 wherein each medium, respectively, exhibits different surface properties.

[0081] In the recording medium set 500 in this embodiment aspect, the greater the number of mediums the better because the greater the number of types of image quality images can then be obtained, and the more will be manifested the effectiveness thereof, particularly in cases where used as a trial recording medium set. There is also no problem whatever if recording mediums exhibiting mutually identical surface properties are contained in the recording medium set of this embodiment aspect.

[0082] A description is given next of procedures for printing text or images and the like using the composite recording mediums described in the foregoing. One example of a composite recording medium wherein two or more types of parts having differing surface properties are integrated is diagrammed in Fig. 15. The composite recording medium 700 diagrammed in Fig. 15 is configured by a glossy tone part 71 and a silk-weave tone part 72. The glossy tone part 71, for example, can be used as an image printing area and the silk-weave tone part 72 can be used as a text printing area. Thus, when there are a part where one wishes to print images and a part where one wishes to print text on one sheet of recording paper, if the composite recording medium of the present invention is used, recording paper can be provided wherewith the printing application in each printing area is conformed with.

[0083] Fig. 16 is a block diagram of the configuration of a print processing apparatus (dot recording apparatus) of the present invention. The print processing apparatus is configured such that it comprises a scanner 10, a computer terminal 20, and a color printer 30. The computer terminal 20 comprises a color display 40. The scanner 10 reads color image data from original color copy, and sends primary color image data consisting of the three colors R (red), G (green), and B (blue) to the computer terminal 20.

[0084] In the computer terminal 20, an application program 21, video driver 22, and printer driver 23 run under an operating system. The print driver 23 takes image data from the application program 21 and performs image processing to convert those data into signals that are printable by a color printer 30, that is, into binary-converted signals Y (yellow), M (magenta), C (cyan), and K (black). A color display 40 displays images indicating how that image processing is proceeding based on instructions from the video driver 22. The video driver 22 also controls operating screens for the application program 21.

[0085] The printer driver 23 comprises a rasterizer 24, color correction module 25, halftone module 26, and color correction table 27. The rasterizer 24 converts the image data handled by the application program 21 to color information in dot units. The color correction module 25 references the color correction table 27, subjects the image data (RGB 256 tone data) converted to dot units to color correction according to the characteristics of the colors produced by the color printer 30, converting those data to YMCK image data. The color correction table 27 is read by the printer driver 23 from the color printer 30 when the computer terminal 20 is started up.

[0086] Because parts having different surface properties are intermingled in the composite recording medium, matched to the print application for each printing area, the color correction table is different for each printing area. For that reason, a color correction table (look-up table = LUT) is stored for each of the printing areas, respectively, configuring the composite recording medium, in the color printer 30, as diagrammed in Fig. 25.

[0087] Fig. 25 also represents a recording mode table wherein are registered color correspond tables and recording modes for various types of composite recording medium. For example, a type 1 composite recording medium comprises two types of printing areas, namely

a glossy tone part and a silk-weave tone part, for each of which are registered, respectively, a color correction table, range (coordinate data representing printing area positions on the composite recording medium), number of nozzles used N, and secondary scan feed amount L, etc. The number of nozzles used N and the secondary scan feed amount L are recording mode parameters used when printing images or text in the respective printing areas.

[0088] Furthermore, as will be described subsequently, the recording mode parameters, in addition to the number of nozzles used N and the secondary scan feed amount L, also include such parameters as nozzle pitch k and number of scan repetitions s, but these are not described further in the interest of expedience.

[0089] Similarly, a type 2 composite recording medium is configured of three types of printing area, namely a glossy tone part, a semiglossy tone part, and a silk-weave tone part. The glossy tone part can be used as a printing area for images of high image quality, the semiglossy tone part as a printing area for images of low image quality, and the silk-weave tone part as a text printing area, for example. For these printing areas are registered resolution levels, color correction tables, ranges, number of nozzles used N, and secondary scan feed amount L, etc.

[0090] When the user inputs a type for the composite recording medium 700 following directions displayed on the screen of the color display 40, the color correction module 25 references the corresponding look-up table from the color correction table 27 and performs color correction. In this example, the type of the composite recording medium 700 is type 1, wherefore the user operates the computer terminal 20 to indicate that the type is type 1. When that is done, the color correction module 25 determines the positions of the glossy tone part and silk-weave tone part from the coordinate data for each printing area registered in the recording mode table, performs color correction for the glossy tone part referencing LUT1, and performs color correction for the silk-weave tone part referencing LUT2.

[0091] The halftone module 26 performs halftone processing that expresses density in some area by the presence or absence of ink in dot units from image data after they have been color corrected. For the halftone processing there are dithering and error dispersion, etc. The printer driver 23 sends the YMCK binary-converted image data to the color printer 30. Also included in those image data are text data that are binary-converted by the absence or presence of dots. The color printer 30 prints the prescribed text and images, etc., on the composite recording medium 700 on the basis of the image data supplied from the printer driver 23.

[0092] In the foregoing description, the case is considered where color image data are input from the scanner 10, but color image data may also be input from a digital still camera or video camera, etc.

[0093] Furthermore, the above explanation indicates the example in which printer driver 23 operating on computer terminal 20 converts via application program 21 the color image data of RGC fetched from scanner 10 to a printable image data, in short, a multivalued image data of YMCK at color printer 30, and supplies the multivalued image data to color printer 30.

[0094] However it is possible to embed a function which corresponds to printer driver 23 in color printer 30 so that the color image data fetched from scanner 10 is provided with the preferable image processings in the color printer 30 such as color conversion, color amendment, and half tone processing, etc., and the multivalued image data of YMCK is gained. In short, the image processing in color printer 30 can be performed by software but it is also can be performed by providing an exclusive hardware.

[0095] Fig. 17 is a simplified configurational diagram of a printer engine unit in the color printer 30. In Fig. 17, the color printer 30 comprises a mechanism for conveying the composite recording medium 700 by a paper feed motor 51, a mechanism for causing a carriage 60 to move back and forth in the direction of the shaft of a platen 52 by a carriage motor 53, a mechanism for driving a print head 63 mounted on the carriage 60 and controlling ink ejection and dot recording, and a control circuit 81 for controlling the operations of the paper feed motor 51, carriage motor 53, and print head 63.

[0096] Comprised in the mechanism that causes the carriage 60 to move back and forth are a sliding shaft 55, suspended parallel to the platen 52, that holds the carriage 60 so that it can slide, a pulley 54 that holds an endless drive belt 56 in tension between itself and the carriage motor 53, and a position detection sensor 57 for detecting the position of the print head 63. The print head 63 position information is sent to the control circuit 81. The control circuit 81 comprises a non-volatile memory 82 that stores the recording mode table described earlier, and controls the operations of the print head 63, paper feed motor 51, and carriage motor 53 while referencing that recording mode table. (A more detailed description is given further below.)

[0097] The recording mode table is read out from the non-volatile memory 82 by the printer driver 23 when the computer terminal 20 is started up. Some of the data in the recording mode table are used as the color correction table 27 in the color correction processing for the image data read in from the scanner 10. An operating panel 83 is connected to the control circuit 81.

[0098] For the non-volatile memory 82, a rewritable non-volatile memory such, for example, as an EEPROM (electronically erasable and programmable read only memory) or UV-EPROM (ultraviolet erasable programmable read only memory) can be used.

[0099] The carriage 60 is capable of having mounted therein a black ink cartridge 61 and a color ink cartridge 62 containing ink of the three colors cyan, magenta, and yellow. To the print head 63 in the lower part of the carriage 60 are attached a total of four ink ejecting heads

64 to 67, and in the bottom of the carriage 60 are erected induction lines for inducting ink from ink tanks to these heads for the several colors. When the black ink cartridge 61 and the color ink cartridge 62 are mounted in the carriage from the top, the induction lines are inserted into connection holes provided in the cartridges, making it possible for ink to be supplied from the ink cartridges to the ink ejecting heads 64 to 67.

[0100] The ink ejection mechanism in the ink ejection head 64 is next described. As diagrammed in Fig. 18, when the ink cartridge 61 is mounted at the induction hole 66, ink inside the ink cartridge 61 is sucked out through the induction line 66, by means of capillary action, and delivered to the ink ejection head 64 of the print head 63 deployed in the lower part of the carriage 60. As diagrammed in Fig. 19, a plural number of nozzles 90 is provided in the ink ejection head 64, and a piezoelectric element 80 that is one type of electrostriction element is deployed for each nozzle 90.

[0101] Fig. 20 and Fig. 21 are sections of the ink ejection head 64. The piezoelectric element 80 is an electromechanical conversion element, wherein a crystal structure is distorted by the application of a voltage, that converts electrical energy to mechanical energy. Fig. 20 represents a condition wherein no voltage is being applied across the electrodes provided at both ends of the piezoelectric element 80. When a voltage is applied across these electrodes, as diagrammed in Fig. 21, the piezoelectric element 80 expands for the time that the voltage is applied, causing one side wall of a pressurized chamber (cavity) 68 to be deformed. As a result, the volume of the pressurized chamber 68 contracts in response to the expansion of the piezoelectric element 80, whereupon ink corresponding in volume to the amount of that contraction becomes an ink droplet 69 which is ejected at high speed from the tip of the nozzle 90. Dot recording is performed by this ink droplet 69 impacting the composite recording medium 700 that is conveyed by the platen 52. The description given here relates to the configuration of the ink ejection head 64, but the ink ejection heads 65 to 67 have the same configuration.

[0102] The color printer 30 having the hardware configuration described in the foregoing, while turning the platen 52 by the paper feed motor 51 to convey the composite recording medium 700, causes the carriage 60 to move back and forth by the carriage motor 53, simultaneously drives the ink ejection heads 64 to 67 provided in the print head 63 to eject the Ink of each color, and forms text and images, etc., in multiple colors, on the composite recording medium 700.

[0103] Fig. 22 is an explanatory diagram representing an array of ink jet nozzles in the ink ejection heads 64 to 67. In the ink ejection head 64 is deployed a nozzle array for ejecting black ink. In the ink ejection heads 65 to 67 are deployed nozzle arrays for ejecting, respectively, cyan, magenta, and yellow ink. The positions of these four nozzle array groups are mutually coincidental in the secondary scanning direction. The four nozzle array groups each comprise a plural number of nozzles 90 arranged in a staggered formation with a constant nozzle pitch k in the secondary scanning direction.

[0104] Fig. 23 represents an array of a plurality of dots formed by one nozzle array. In this embodiment, irrespective of whether the ink nozzles are arrayed in a staggered formation or in a straight line, drive signals are supplied to the piezoelectric elements 80 in the nozzles so that the plural number of dots recorded by one nozzle array line up in roughly a straight line in the secondary scanning direction. As diagrammed in Fig. 22, for example, in the case where the nozzle array is arrayed in a staggered formation, the case is considered where dots are recorded as the ink ejection head 61 is scanned in the rightward direction, in the figure. At this time, the leading nozzle groups 91 and 93 are sent a drive signal at a timing that is faster by d/v (seconds) than the timing wherewith the drive signal is sent to the following nozzle groups 92 and 94. Here, d (in inches) is the pitch between two nozzle groups in the ink ejection head 61, while v (in inches/second) is the scanning speed of the ink ejection head 61.

[0105] Thus, by regulating the timing of the drive signals sent to the nozzle groups, a plurality of dots recorded by one nozzle array is arrayed in a straight line along the secondary scanning direction. Furthermore, as will be described later, the multiple nozzles provided in the ink ejection heads 64 to 67 are not limited to being always all used. Depending on the recording mode, there are also cases where only a portion thereof is used.

[0106] Fig. 24 is a functional block diagram for a configuration relating to drive control corresponding to a recording mode. In Fig. 24 are indicated a recording mode setting unit 31, recording mode table 32, raster data storage unit 33, drive unit controller 34, primary scan drive unit 35, secondary scan drive unit 36, print head drive unit 37, print head 63, and composite recording medium 700. The recording mode table 32 is the recording mode table diagrammed in Fig. 25, which is stored in the non-volatile memory 82. In this same table are registered the recording mode parameters and color correction tables for each of the printing areas configuring the composite recording medium, etc.

[0107] The recording mode setting unit 31, raster data storage unit 33, and drive unit controller 34 are implemented by circuitry inside the control circuit 81. The primary scan drive unit 35 is implemented by the carriage 60 feed mechanism that includes the carriage motor 53, while the secondary scan drive unit 36 is implemented by the recording medium 700 feed mechanism that includes the paper feed motor 51. And the print head drive unit 37 is implemented by a circuit that includes the piezoelectric elements 80 for the nozzles 90.

[0108] In the header part of the image data sent from the computer terminal 20 to the recording mode setting unit 31 is written information indicating the type (type 1 in this example) of the composite recording medium

700. The recording mode setting unit 31 distinguishes the type of the composite recording medium 700 from the image data header, and fetches the corresponding recording mode parameters from the recording mode table 32. As described earlier, the recording mode parameters include such parameters as are required for dot recording, such as the ranges of the print areas, the number of nozzles used N, and the secondary scan feed amount L.

[0109] As diagrammed in Fig. 25, for example, the number of nozzles used is Nl and the secondary scan feed amount is L1 for the glossy tone part configuring the composite recording medium 700, and the number of nozzles used is N2 and the secondary scan feed amount is L2 for the silk-weave tone part. The recording mode parameters such as the number of nozzles used N and the secondary scan feed amount L differ for each printing area. Therefore the recording mode setting unit 31, based on the print head 63 position information sent from the position detection sensor 57, determines whether the printing area that will be the object of dot recording in the next primary scan is a glossy tone part or a silk-weave tone part.

[0110] When it is determined that the printing area to be the object of dot recording is a glossy tone part, the recording mode setting unit 31 sends the number of nozzles used Nl and secondary scan feed amount Ll as recording mode parameters to the raster data storage unit 33 and the drive unit controller 34. When, on the other hand, it is determined that the printing area that is to be the object of dot recording is a silk-weave tone part, the recording mode setting unit 31 sends the number of nozzles used N2 and the secondary scan feed amount L2 as recording mode parameters to the raster data storage unit 33 and the drive unit controller 34. The sending of these recording mode parameters is done prior to the previous scan.

[0111] The raster data storage unit 33, based on the recording mode parameters sent from the recording mode setting unit 31, stores image data in a buffer memory (not shown). Meanwhile, the drive unit controller 34, in response to the recording mode parameters sent from the recording mode setting unit 31, controls the primary scan drive unit 35, secondary scan drive unit 36, and print head drive unit 37.

[0112] Fig. 26 is an explanatory diagram for the recording mode parameters. In Fig. 26, one example of secondary scan feed in the case where four nozzles are used is represented in order to simplify the explanation. In Fig. 26, moreover, the solid line circles containing numerals indicate the positions in the secondary scanning direction of the four nozzles 90 after each secondary scan feed. The numerals 0 to 3 inside the circles are nozzle numbers. The four nozzle positions are fed in the secondary scan direction every time one primary scan ends. In actuality, however, the feed in the secondary scanning direction is implemented by conveying the composite recording medium 700 with the paper feed motor 51. As indicated at the left edge in Fig. 26, in this example, the secondary scan feed amount L is the constant value of 2 dots. Accordingly, the positions of the four nozzles 90 shift by 2 dots at a time in the secondary scanning direction every time the secondary scan is effected. In the example diagrammed here, moreover, the nozzle pitch k is 3 dots, and the number of nozzles used N is 4.

[0113] The number of nozzles used, furthermore, is the number of nozzles actually used of the plurality of nozzles mounted. The number of scan repetitions s means that dots are recorded intermittently every s-1 dots in one primary scan. Accordingly, the number of scan repetitions s is also equal to the number of nozzles used for recording all the dots on one raster.

[0114] In Fig. 27 are diagrammed recording mode parameters wherein the secondary scan feed amount L for each secondary scan feed, the cumulative value of the secondary scan feed amount ΣL, and an offset F are noted for a case where the nozzle pitch k = 3, the number of nozzles used N = 4, the number of scan repetitions s = 2, and the effective number of nozzles Neff = 2. Here, the offset F is a value that, having arbitrarily established the periodic position of the first nozzle where a secondary scan feed is not effected (a position recurring every 4 dots in Fig. 26) as a reference position at offset 0, indicates by how many dots the position of the nozzle after a secondary scan feed is removed from that reference position in the secondary scanning direction.

[0115] As diagrammed in Fig. 26, for example, by one secondary scan feed, the nozzle positions move by precisely the amount of the secondary scan feed (i.e. by 2 dots). Meanwhile, however, the nozzle pitch is 3 dots. Accordingly, the nozzle offset F after the first secondary scan feed is 2. Similarly, the nozzle position after the second secondary scan feed will have moved ΣL - 4 dots from the initial position, and the offset F therefor will be 1. The nozzle position after the third secondary scan feed will have moved ΣL = 6 dots from the initial position, and the offset F therefor will be 0. The nozzle offset F is returned to 0 by the third secondary scan feed, wherefore, taking three secondary scan feeds as one small cycle, by repeating that small cycle, all of the dots on the raster in the effective recording range can be recorded.

[0116] By means of the configuration described in the foregoing, by setting the values of the recording mode parameters to values suitable for high image quality printing for the glossy tone,part, making the value of the number of nozzles used N large and the value of the secondary scan feed amount L small, for example, the printing speed will decline but high-definition printing is made possible. On the other hand, by setting the values of the recording mode parameters to values suitable to high-speed printing for the silk-weave tone part, making the value of the number of nozzles used low and the value of the secondary scan feed amount L large, for

example, image quality will decline but high-speed printing is made possible. Thus, when there are multiple printing areas having different print applications on one composite recording medium, by setting recording mode parameters suitable to the print application in each printing area, printing with high image quality is made possible without dramatically lowering the printing speed of the overall printing process.

[0117] The description given in the foregoing is for the printing processing of a composite recording medium wherein, in terms of printing area, two or more types of parts having different surface properties are integrated. In addition thereto, however, a composite recording medium wherein, in terms of printing area, two or more types of parts exhibiting different glossiness and/or different smoothness are integrated may be used. The two or more types of parts, moreover, may be two or more types of parts selected from a group made up of glossy tone parts, semiglossy tone parts, matte tone parts, and silk-weave tone parts. Of those two or more types of parts, furthermore, one or more of those parts may have multiple recording areas distinguished by the strength or weakness of the light reflectance exhibited thereby.

[0118] In other words, for two or more types of parts having different glossiness and/or different smoothness, respectively, it is possible to set color correction tables and recording mode parameters suitable to that printing application, and for multiple recording areas distinguished by the strength or weakness of the light reflectance exhibited thereby, respectively, it is possible to set color correction tables and recording mode parameters suitable to that printing application.

[0119] Also, the composite recording medium used in the dot recording processing in the present invention may have an ink accepting layer. Or the composite recording medium may be one comprising a base material, a resin coating layer made up of two or more types of parts having different face properties, and an ink accepting layer deployed with that resin coating layer intervening. Or the composite recording medium may be one comprising a base material, an ink accepting layer deployed on that base material, and two or more types of parts having different surface properties deployed on that ink accepting layer. Or the composite recording medium may be one comprising a printing base material whereon is formed an ink accepting layer made up of two or more types of parts having different surface properties, and a pressure sensitive adhesive layer and peel-away base material deployed on the face on the opposite side from the ink accepting layer in that printing base material.

[0120] Specific examples of the composite recording medium used in the present invention include machine glazed paper, greeting cards (post cards) and the like in which two or more types of parts having different surface properties are integrated.

[0121] The present invention can also be applied to printing that represents multiple gradations by representing one pixel with a plurality of dots. It can also be applied in a drum scan printer. With a drum scan printer, however, the direction in which the drum turns will be the primary scanning direction, and the direction in which the carriage travels will be the secondary scanning direction. The present invention can be applied not only to ink jet printers, but more generally in dot recording apparatuses that make recordings on the surface of a composite recording medium using recording heads having plural dot recording element arrays.

[0122] In the configuration described in the foregoing, some of the functions implemented in hardware may be implemented instead in software, and, conversely, some of the functions implemented by software may be implemented instead in hardware. For example, the functions implemented with the control circuit 81 of the color printer 30 may be configured so that they are performed by the computer terminal 20. In that case, programs such as the printer driver 23 will implement functions equivalent to those implemented by the control circuit 81.

[0123] Based on the present invention, composite recording mediums are provided wherewith it is possible most effectively to obtain recorded images having the desired image quality. Based on the present invention, moreover, composite recording mediums are provided that afford outstanding productivity in that images having multiple image qualities can be obtained at one time. Based on the present invention, furthermore, a recording method and manufacturing method for composite recording mediums wherewith recorded images having the desired image quality are obtained most effectively are provided.

[0124] Also, based on the present invention, recordings having recorded images exhibiting the desired image quality are provided. Based on the present invention, moreover, a recording medium set is provided wherewith recorded images can most effectively be obtained which exhibit the desired image quality.

[0125] Also, based on the present invention, color correction processing and dot recording processing can be implemented that are suitable, respectively, to two or more types of parts configuring a composite recording medium, wherefore high-image-quality dot recording processing can be effected without dramatically lowering the dot recording processing speed in the composite recording medium overall.

Claims

1. A composite recording medium formed with two or more types of parts exhibiting different surface properties integrated therein.

2. A composite recording medium formed with two or more types of parts exhibiting different glossiness and/or different smoothness integrated therein.

3. The composite recording medium according to claim 1 wherein said two or more types of parts are two or more types of parts selected from a group consisting of a glossy tone parts, semiglossy tone parts, matte tone parts, and silk-weave tone parts.

4. The composite recording medium according to claim 3, wherein, of said two or more types of parts, one or more parts has a plurality of recording areas distinguished by strength or weakness of light reflectance exhibited thereby.

5. The composite recording medium according to claim 1, wherein said composite recording medium has an ink accepting layer.

6. A composite recording medium comprising:

a base material;
a resin coating layer comprising two or more types of parts exhibiting different surface properties, deployed on said base material; and
an ink accepting layer deployed thereon with said resin coating layer interposed therebetween.

7. A composite recording medium comprising:

a base material;
an ink accepting layer deployed on said base material; and
a glossy layer comprising two or more types of parts exhibiting different surface properties, deployed on said ink accepting layer.

8. A composite recording medium comprising:

a printing base material whereon is formed an ink accepting layer comprising two or more types of parts exhibiting different surface properties; and
a pressure sensitive adhesive layer and peel-away base material deployed on surface on opposite side from said ink accepting layer in said printing base material.

9. The composite recording medium according to claim 1 wherein said composite recording medium is an ink jet recording medium.

10. The composite recording medium according to claim 1 wherein said composite recording medium is a trial recording medium for recording ink images of desired image quality.

11. A composite recording medium manufacturing method wherein:

a resin coating layer is formed on a base material;
two or more types of surface properties are thereafter imparted to said resin coating layer by rollers; and
an ink accepting layer is formed on said resin coating layer to which surface properties have been imparted;
whereby imparting two or more types of surface properties.

12. A composite recording medium manufacturing method wherein:

an ink accepting layer is formed on a base material;
a glossy layer is then formed on said ink accepting layer; and
two or more types of surface properties are then imparted to said glossy layer by using film.

13. A composite recording medium manufacturing method wherein:

two or more types of recording medium pieces having different surface properties are formed; and
said medium pieces, respectively, are integrated with tape.

14. A composite recording medium manufacturing method wherein:

two or more types of recording medium pieces having different surface properties are formed; and
said medium pieces, respectively, are affixed onto a supporting body.

15. A composite recording medium manufacturing method wherein:

two or more types of surface properties are imparted to manufacturing raw material of large width, using a plurality of rollers simultaneously; and
each recording medium part is cut away separately.

16. A recording wherein the same ink image is recorded in each of the parts exhibiting different surface properties in the composite recording medium cited in claim 1, respectively.

17. A recording wherein the same ink image is recorded in each of the parts exhibiting different surface properties in composite recording medium obtained by the manufacturing method cited in claim 11.

18. A recording method for composite recording medium wherein, using the composite recording medium cited in claim 1, the same ink image is recorded in each of the parts thereof having different surface properties.

19. A composite recording medium recording method wherein, using a composite recording medium obtained by the manufacturing method cited in claim 11, the same ink image is recorded in each of the parts thereof having different surface properties.

20. A recording medium set comprising a plurality of composite recording mediums cited in claim 1, and a plurality of recording mediums, the entire surface of each of which exhibits the same surface property as one of the plurality of surface properties exhibited by said composite recording medium, so that the surface properties exhibited by said recording mediums cover all of said plurality of surface properties.

21. A recording medium set comprising a plurality of composite recording mediums cited in claim 11, and a plurality of recording mediums the entire surface of each of which exhibits the same surface property as one of the plurality of surface properties exhibited by said composite recording medium, so that the surface properties exhibited by said recording mediums cover all of said plurality of surface properties.

22. A recording medium set comprising two or more types of recording mediums exhibiting different surface properties.

23. The recording medium set according to claim 22, wherein said recording medium set is a trial recording medium set for recording ink images of desired image quality.

24. A dot recording apparatus comprising:

a dot recording head comprising a plurality of dot recording elements for recording dots on a composite recording medium formed with two or more types of parts having different surface properties integrated therein;
primary scan drive means for relatively driving said dot recording head and said composite recording medium to effect primary scanning;
head drive means for driving at least part of said dot recording elements during said primary scanning, causing said dot recording elements to effect dot recording;
secondary scan drive means for relatively driving said dot recording head and said composite recording medium to effect e scanning every time said primary scanning ends; and
control means for effecting dot recording on a composite recording medium by: storing beforehand color correction tables for converting prescribed image data to image data which are color-separated into element colors suitable for dot recording processing, for two or more types of parts configuring said composite recording medium, respectively; storing beforehand parameters for defining operations of said primary scan drive means at time of said primary scanning for recording dots, parameters for defining operations of said head drive means during dot recording, and parameters for defining operations of said secondary scan drive means during said secondary scanning; converting image data while referencing corresponding color correction tables for said two or more types of parts, respectively; and controlling operations of said primary scan drive means, said head drive means, and said secondary scan drive means while referencing said parameters.

25. The dot recording apparatus according to claim 24, wherein said color correction tables are look-up tables established in correspondence with surface properties of said two or more types of parts, respectively.

26. The dot recording apparatus according to claim 24, wherein said parameters comprise one or other of number of nozzles used in said dot recording head, nozzle pitch in said dot recording head, secondary scan feed amount of said secondary scan drive means, and number of scan repetitions of said primary scan drive means.

27. The dot recording apparatus according to claim 24, wherein at least image printing areas and text printing areas are comprised as printing areas configured by said two or more types of parts.

28. A dot recording method for effecting dot recording on a composite recording medium, comprising the steps of:

for each of two or more parts configuring a composite recording medium formed with two or more types of parts exhibiting different surface properties integrated therein, storing beforehand color correction tables for converting prescribed image data to image data color-separated into element colors suitable for dot recording processing; parameters for defining operations of head drive means for effecting drive control of a dot recording head comprising dot recording elements for recording dots on said composite recording medium; parameters for

defining operations of primary scan drive means for relatively driving said dot recording head and said composite recording medium to effect primary scanning; and parameters for defining operations of secondary scan drive means for relatively driving said dot recording head and said composite recording medium to effect secondary scanning every time said primary scanning ends; and

converting image data while referencing corresponding color correction tables for said two or more types of parts, respectively; and

controlling operations of said primary scan drive means, said head drive means, and said secondary scan drive means while referencing said parameters.

29. The dot recording method according to claim 28, wherein said color correction tables are look-up tables established in correspondence with surface properties of said two more types of parts, respectively.

30. The dot recording method according to claim 28, wherein said parameters comprises one or other of number of nozzles used in said dot recording head, nozzle pitch in said dot recording head, secondary scan feed amount of said secondary scan drive means, and number of scan repetitions of said primary scan drive means.

31. The dot recording method according to claim 28, wherein at least image printing areas and text printing areas are comprised as printing areas configured by said two or more types of parts.

32. A recording medium that is computer readable, whereon is recorded a program for implementing in a printing processing apparatus the dot recording method cited in claim 28.

FIG.1

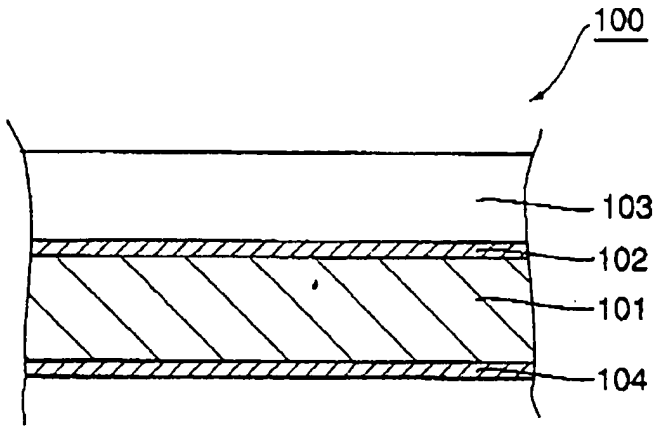

FIG.2

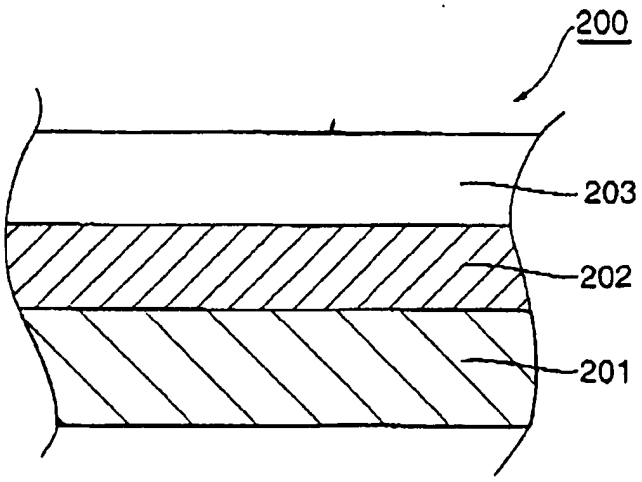

FIG.3

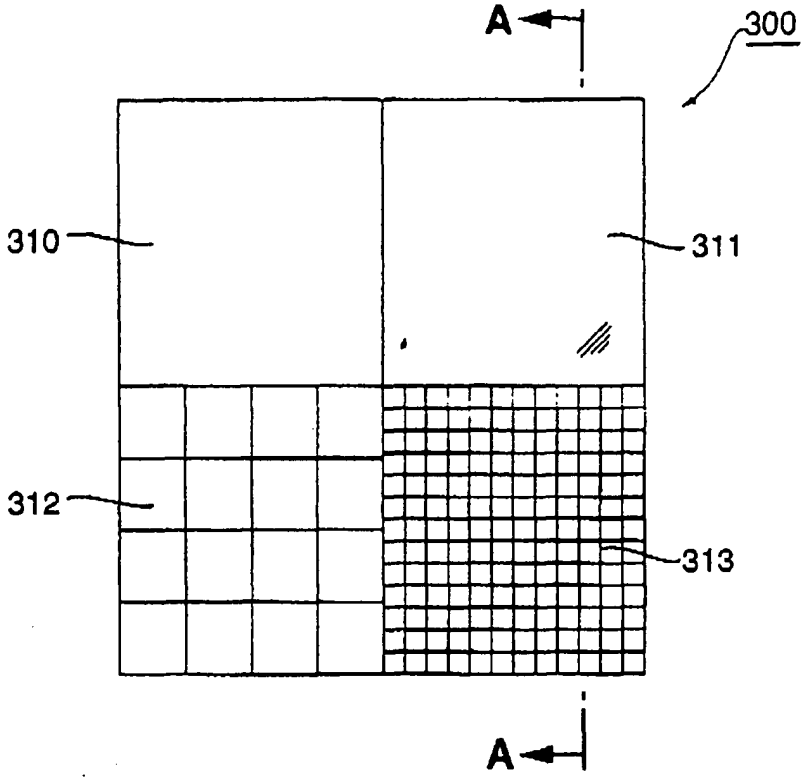

FIG.4

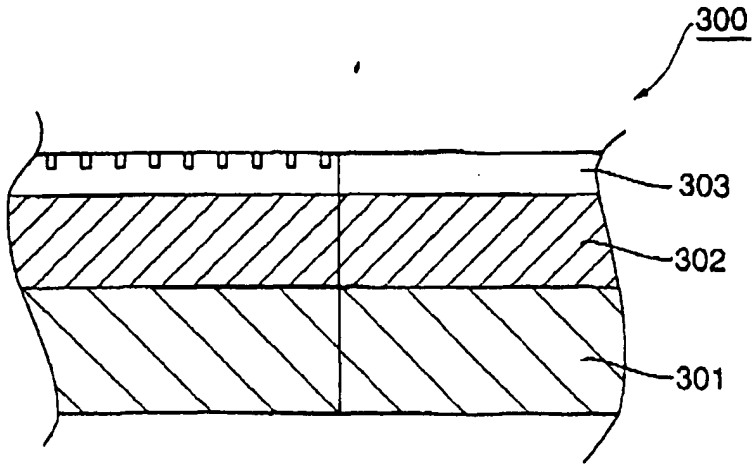

FIG.5

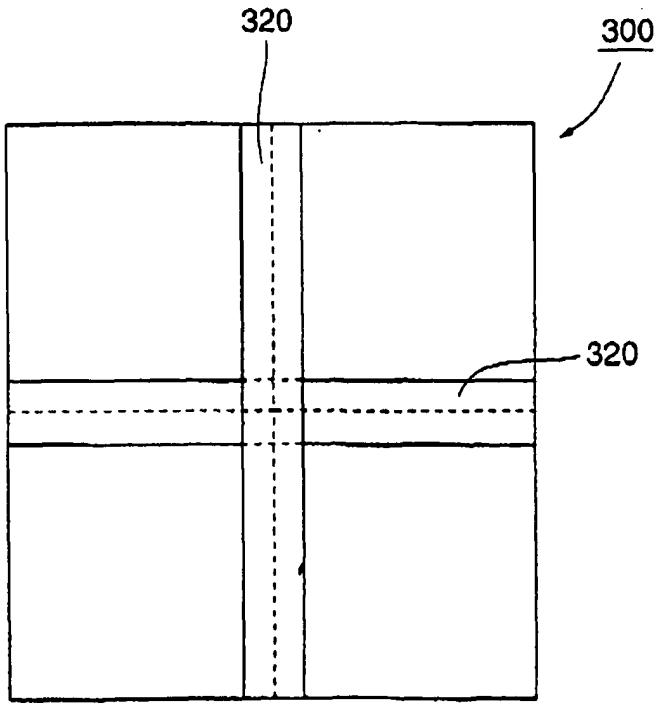

FIG.6

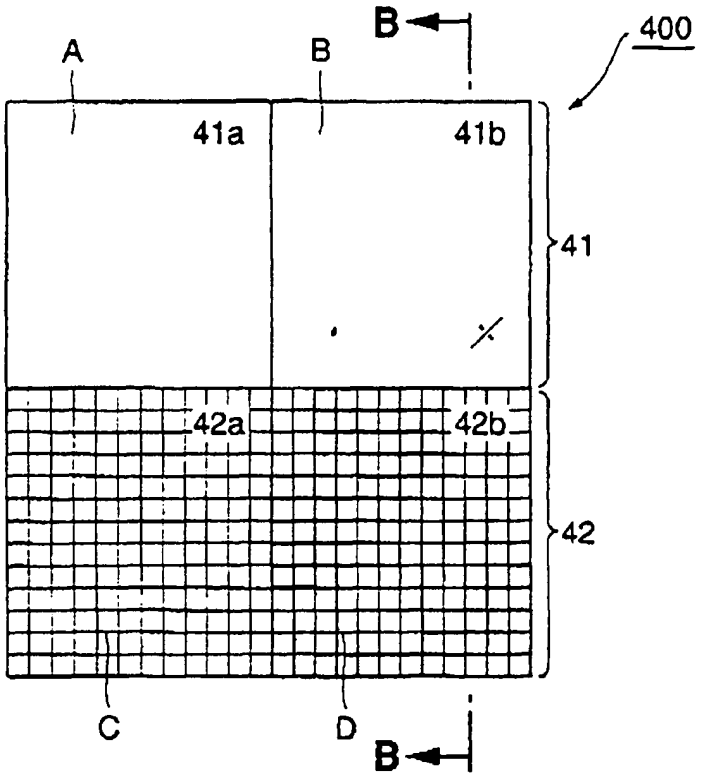

FIG.7

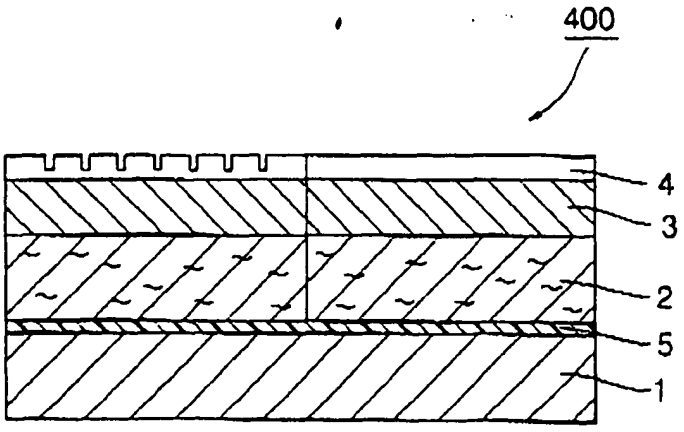

FIG.8

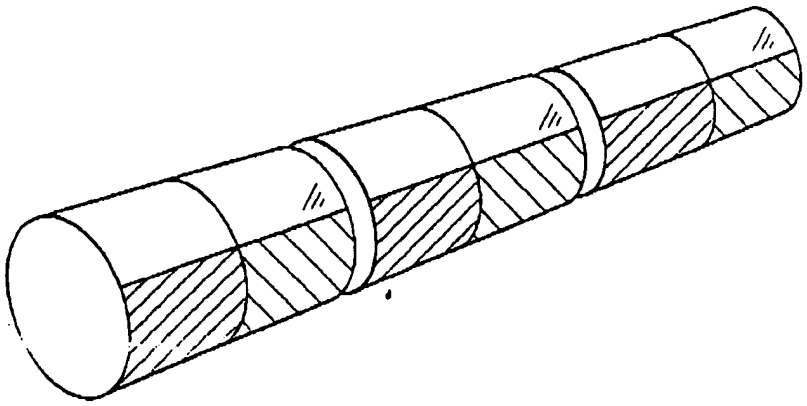

FIG.9

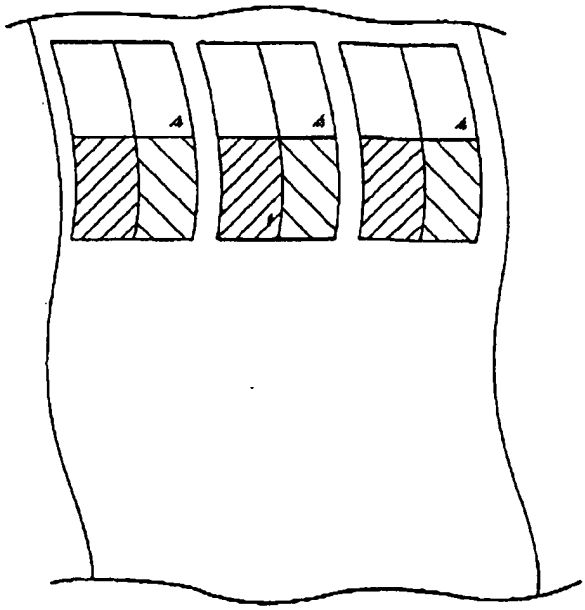

FIG.10

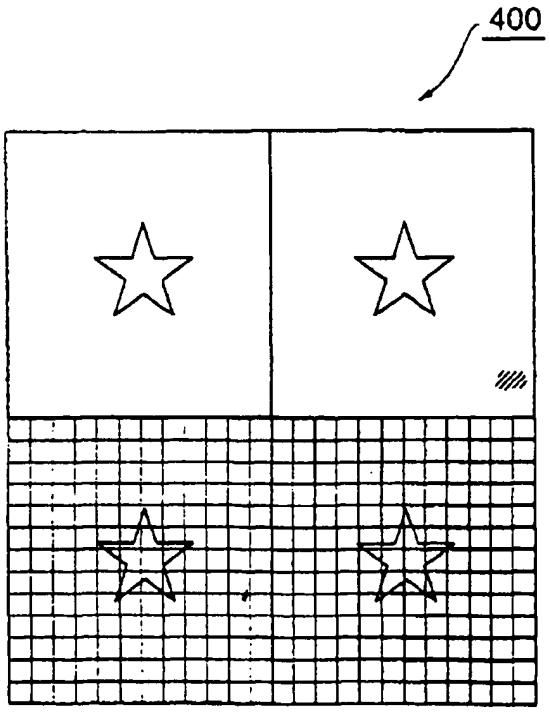

FIG.11

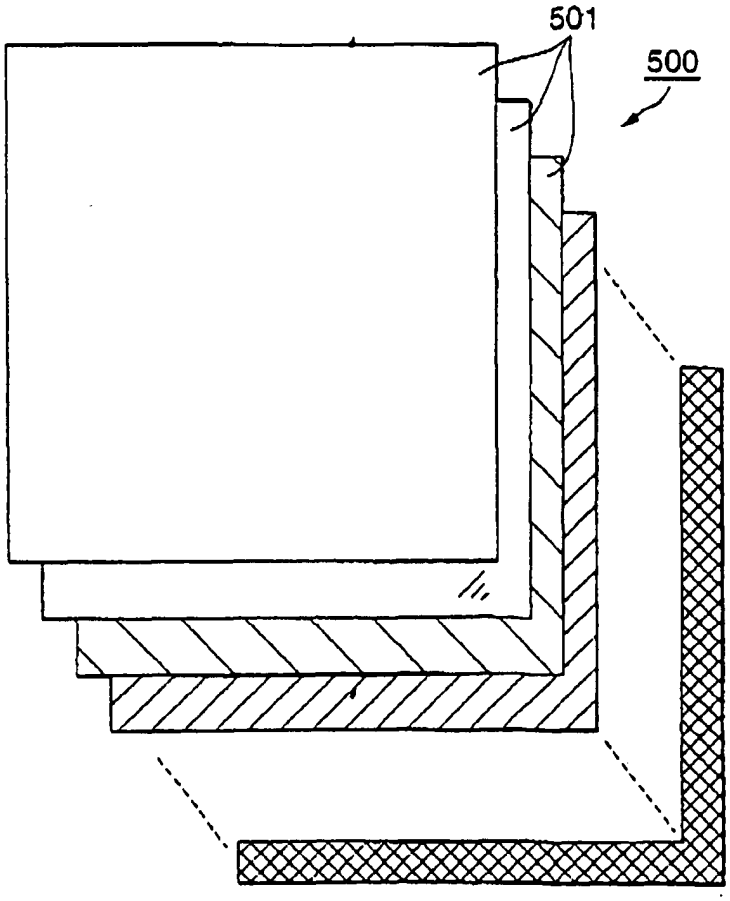

FIG.12

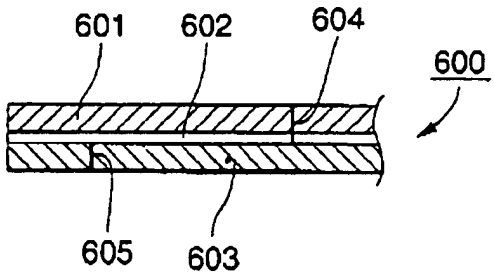

FIG.13

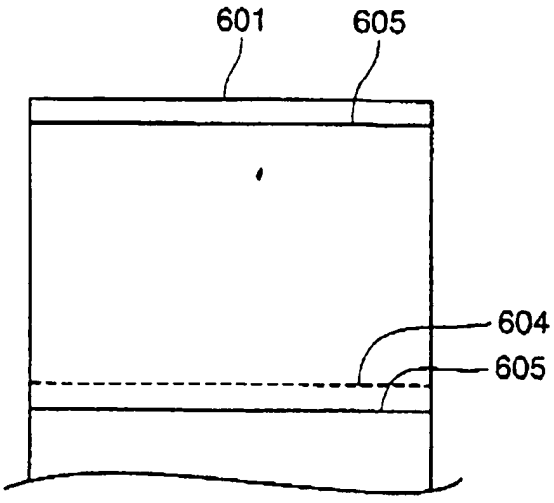

FIG.14

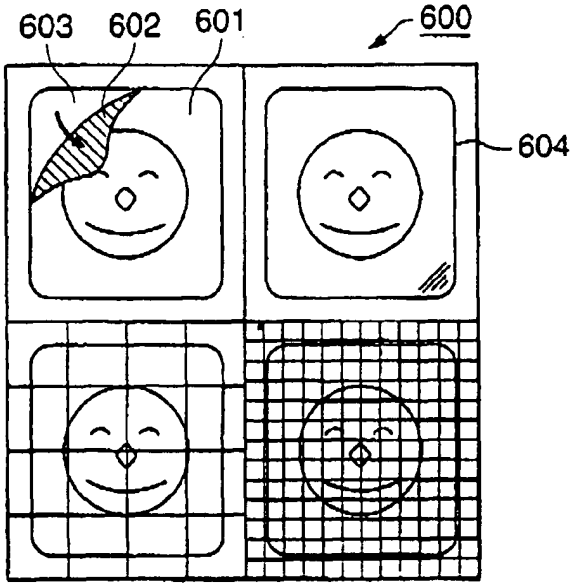

FIG.15

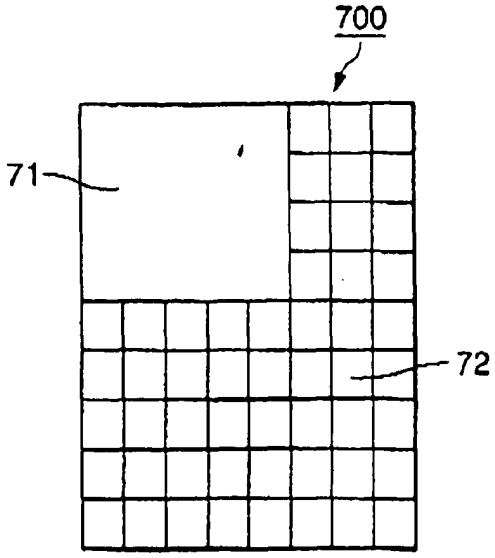

FIG.16

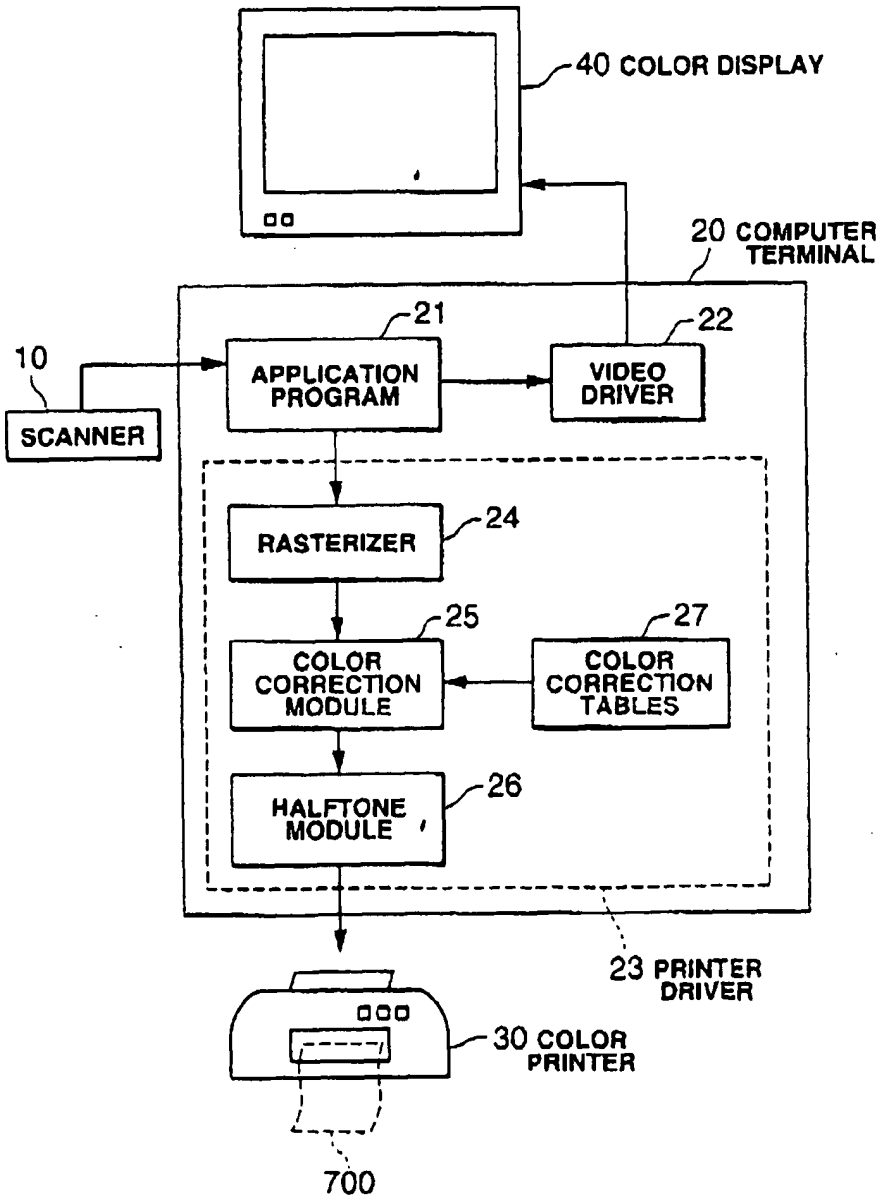
40 COLOR DISPLAY
20 COMPUTER TERMINAL
21
22
10
APPLICATION PROGRAM
VIDEO DRIVER
SCANNER
RASTERIZER
24
25
27
COLOR CORRECTION MODULE
COLOR CORRECTION TABLES
HALFTONE MODULE
26
23 PRINTER DRIVER
30 COLOR PRINTER
700

FIG.17

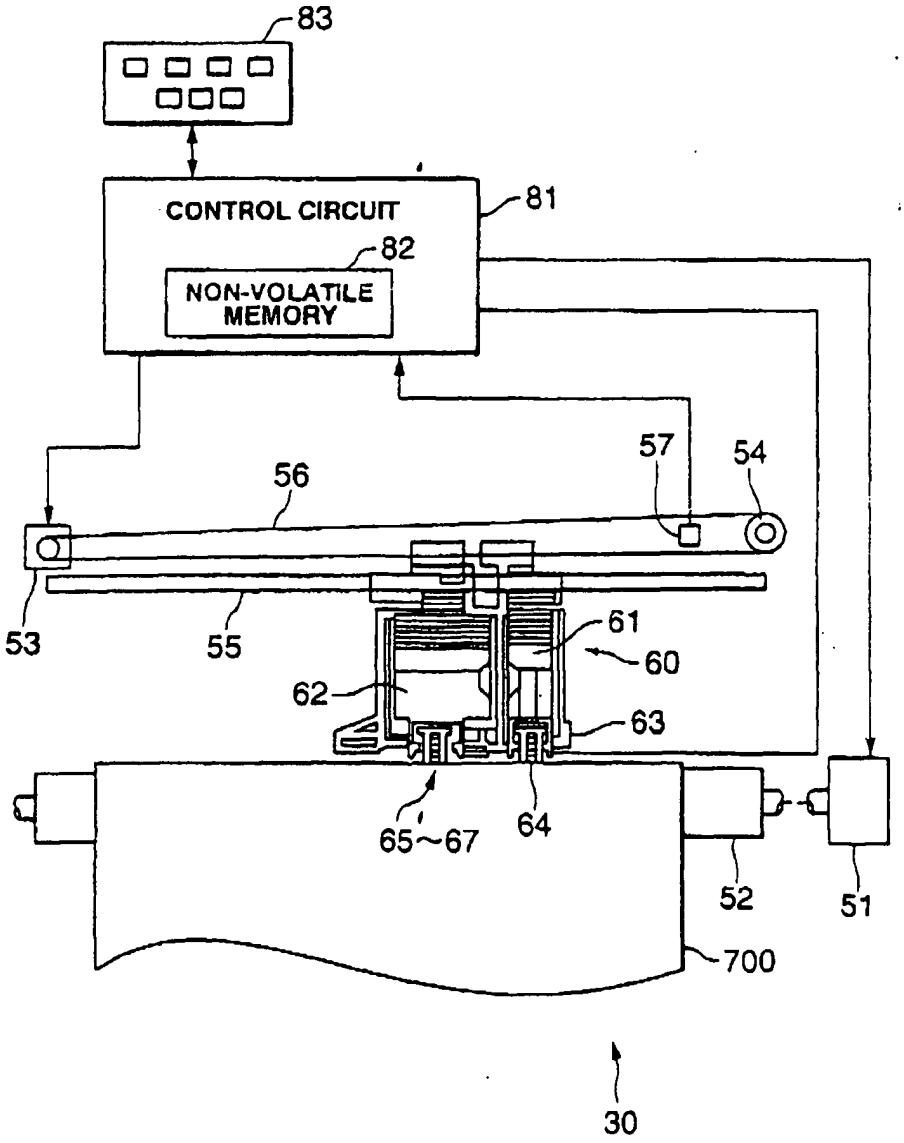
83
CONTROL CIRCUIT
81
82
NON-VOLATILE MEMORY
57
54
56
53
55
61
60
62
63
65~67
64
52
51
700
30

FIG.18

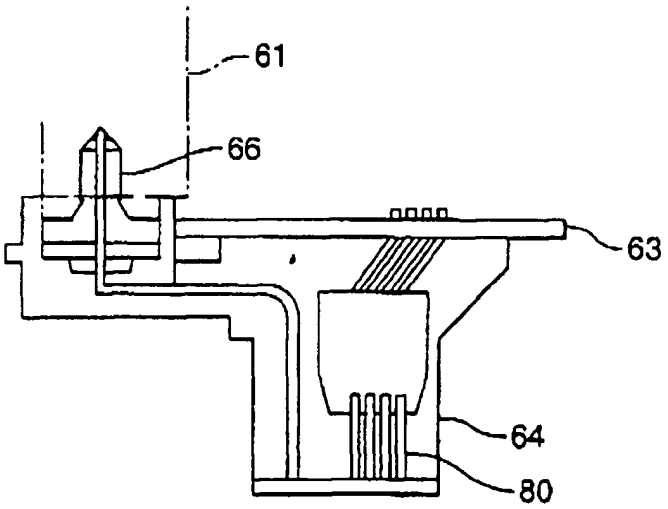

FIG.19

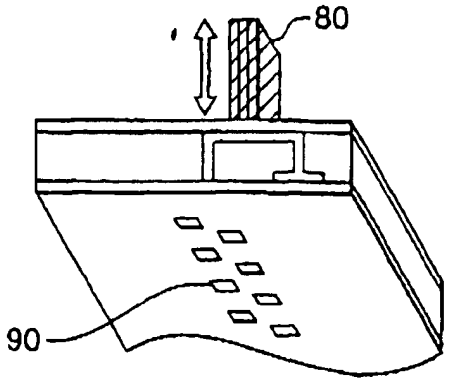

FIG.20

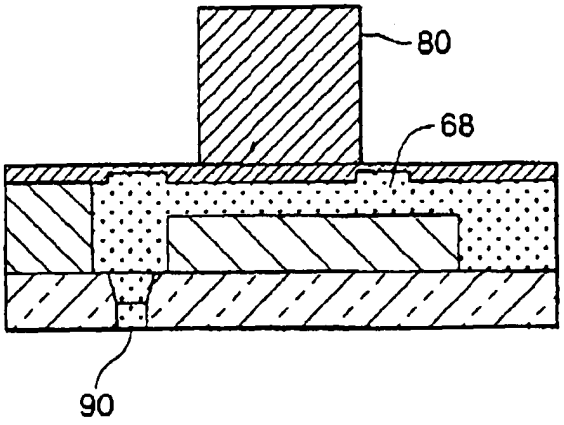

FIG.21

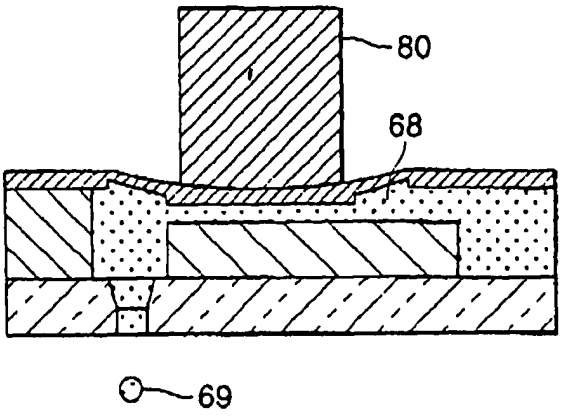

FIG.22

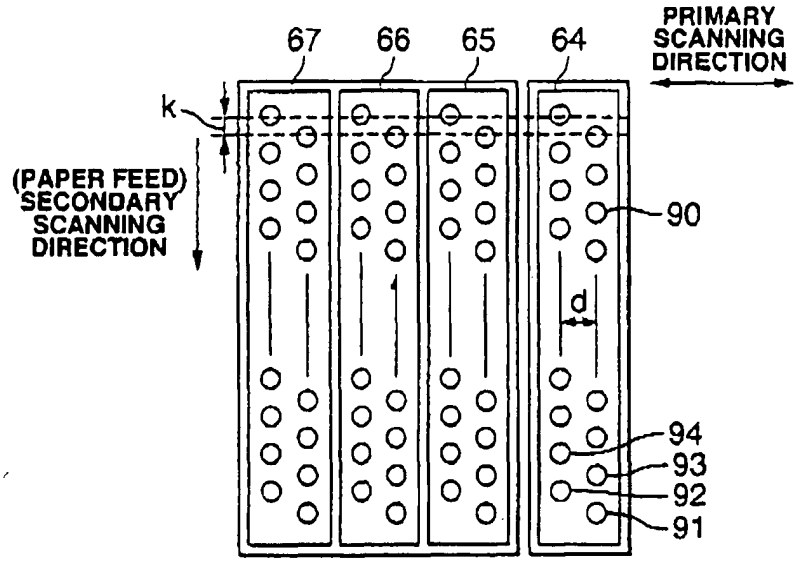
67
66
65
64
PRIMARY SCANNING DIRECTION
k
(PAPER FEED) SECONDARY SCANNING DIRECTION
90
d
94
93
92
91

FIG.23

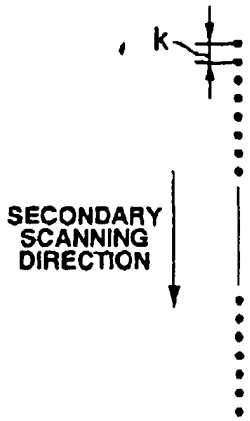
k
SECONDARY SCANNING DIRECTION

FIG.24

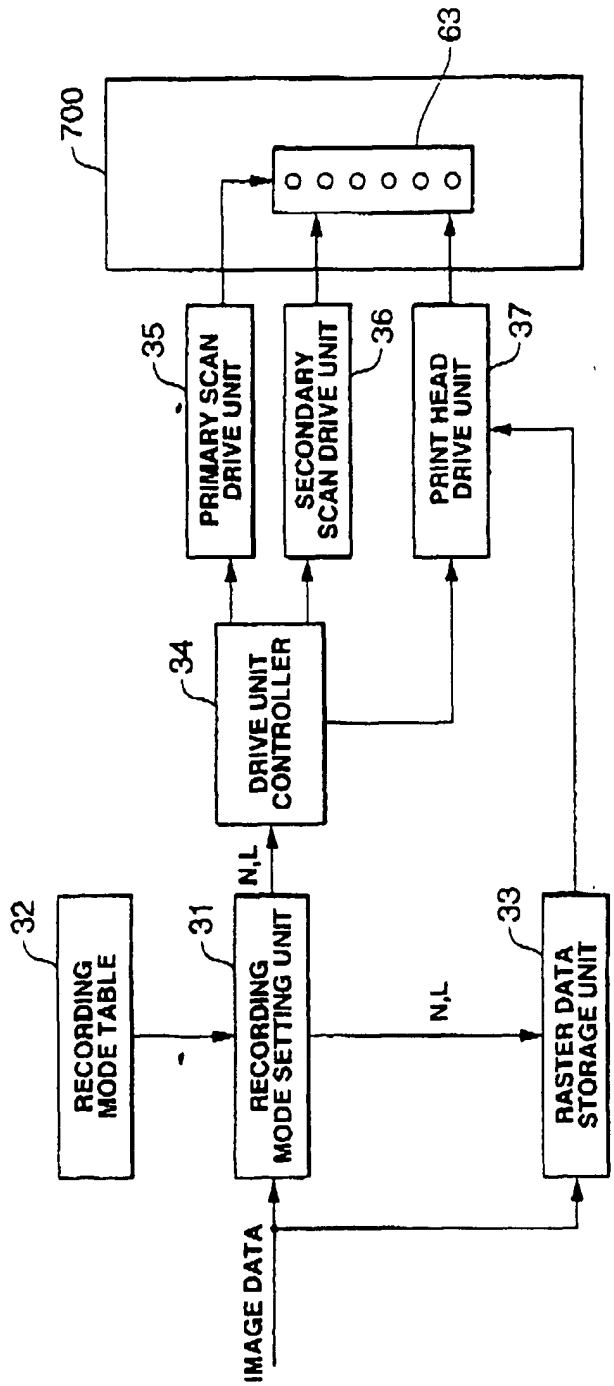
700
63
35
PRIMARY SCAN DRIVE UNIT
36
SECONDARY SCAN DRIVE UNIT
37
PRINT HEAD DRIVE UNIT
34
DRIVE UNIT CONTROLLER
N,L
32
RECORDING MODE TABLE
31
RECORDING MODE SETTING UNIT
N,L
33
RASTER DATA STORAGE UNIT
IMAGE DATA

FIG.25

TYPE	PRINTING AREA	RESOLUTION	COLOR CORRECTION TABLE	RANGE	NUMBER OF NOZZLES USED	SECONDARY SCAN FEED AMOUNT
TYPE 1	GLOSSY TONE PART	720dpi	LUT1	COORDINATE DATA	N1	L1
	SILK-WEAVE TONE PART	360dpi	LUT2	COORDINATE DATA	N2	L2
TYPE 2	GLOSSY TONE PART	720dpi	LUT1	COORDINATE DATA	N1	L1
	SEMIGLOSSY TONE PART	540dpi	LUT3	COORDINATE DATA	N3	L3
	SILK-WEAVE TONE PART	360dpi	LUT2	COORDINATE DATA	N2	L2

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FIG.26

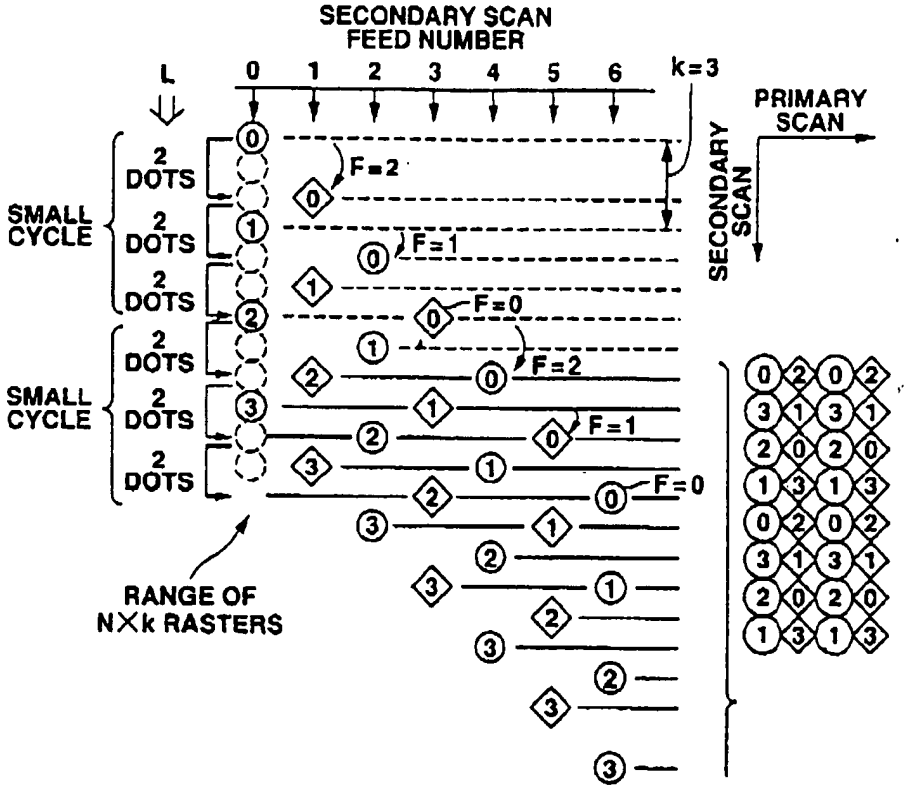

FIG.27

NOZZLE PITCH k :3[dot]
NUMBER OF NOZZLES USED N :4
NUMBER OF SCAN REPETITIONS s :2
EFFECTIVE NUMBER OF NOZZLES Neff :2

SECONDARY SCAN FEED NUMBER	0	1	2	3	4	5	6
FEED AMOUNT L[dot]	0	2	2	2	2	2	2
ΣL	0	2	4	6	8	10	12
F=(ΣL)%k	0	2	1	0	2	1	0